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"Measuring Rental Affordability Dynamics for the Southern United States with Constant  
Quartile Mismatch"

By  
Brad Curtis

A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of the  
requirements of the Sally McDonnell Barksdale Honors College.

Oxford, MS  
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Approved By

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Brad Curtis

## ABSTRACT

Brad Curtis: Measuring Rental Affordability Dynamics for the Southern United States with Constant Quartile Mismatch (Under the direction of James Thomas)

This project centers on the topic of rental housing affordability for southern metropolitan areas in the United States. In an attempt to understand how rents have changed in relation to incomes in cities throughout the American south, this study uses IPUMS data to compare changes in the distributions of rents and incomes from 2000 to 2019 for each of the geographies in question. The Constant Quartile Mismatch metric employed in this project was first implemented in the study "A constant quartile mismatch indicator of changing rental affordability in US Metropolitan areas, 2000 to 2016". This thesis hopes to extend the work done in this initial study by focusing the relatively novel Constant Quartile Mismatch Indicator specifically on southern metropolitan areas. By taking this geographic focus, this project hopes to illicit rental affordability dynamics that may be unique to the Southern United States.

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## **Introduction**

This project explores one of the most significant social issues in the United States today, the affordable housing crisis. In recent years, this crisis rose to national prominence as housing prices have skyrocketed in cities like New York and San Francisco, but its impact has not been limited to the nation's largest metropolises.<sup>1</sup> In 2016, nearly a third of all households in the United States were considered cost burdened, (paying 30% or more of their income for housing).<sup>2</sup> Among renters, the affordability picture becomes even bleaker, with half of all rental households in the United States putting 30% or more of their income towards housing. These increases in rent burden have occurred alongside a tightening in the supply of rental housing. With the 2008 financial crisis pushing former homeowners into the rental market, most metropolitan areas have seen a decrease in the rental housing vacancy rate.<sup>3</sup> This dynamic has put even more upward pressure on rent prices, as the surplus of renters drove up the price on available units. In this thesis, I will shed light on rental housing affordability issues by asking how changes in rents compare to changes in incomes for the 15 most populated southern metropolitan areas over the first two decades of the 21<sup>st</sup> century. Rising national housing costs have been well documented in recent scholarship. However, less is known about how these housing price trends compare to changes in national incomes. As income is intrinsically related

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<sup>1</sup> Romem, Issi. "Explaining the Frenzy in the Housing Market." The New York Times. The New York Times, December 3, 2020. <https://www.nytimes.com/2020/12/03/upshot/home-prices-explaining-frenzy.html>.

<sup>2</sup> Joint Center for Housing Studies (JCHS) of Harvard University. "The State of the Nation's Housing." Cambridge, MA: Joint Center for Housing Studies of Harvard University. (2018).

<sup>3</sup> Gabriel, Stuart, and Gary Painter. "Why affordability matters." Regional Science and Urban Economics 80 (2020): 103378.

to housing affordability, it is important to consider price trends in the context of incomes. In hopes of painting a more wholistic picture of housing affordability, this study will put price and income effects in conversation with each other.

To understand recent affordability trends, scholars have utilized a wide variety of affordability metrics. Traditionally, these metrics have focused primarily on a single ratio, rental cost to household income. In contrast to this traditional approach, the Constant Quartile Mismatch Indicator tracks how rents have changed in relation to regional incomes over the entire distribution of renters in an area. By separately accounting for price and income changes, this novel measure of rental housing affordability paints a more wholistic picture of regional changes in housing affordability. Due to the recent development of this metric, its implementation has been relatively limited. The most notable application of this indicator was carried out by Myers, Dowell and Park in their study *A Constant Quartile Mismatch Indicator of Changing Rental Affordability in U.S. Metropolitan Areas*.<sup>4</sup> In this study, the authors utilize the Constant Quartile Mismatch Indicator to measure changes in rental affordability for the 50 largest metropolitan areas in the United States.

In an attempt to extend the work of Myers and Park, this study will apply the Constant Quartile Mismatch Indicator to 15 southern Metropolitan Areas. The decision to highlight the southern United States is based in an understanding that because of its social and economic diversity, it is difficult to discuss affordability trends for the United States as a whole. By focusing specifically on southern geographies, this study hopes to shed light on the unique affordability dynamics of the southern United States. In aggregate, nominal rents in southern

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<sup>4</sup> Myers, Dowell, and JungHo Park. "A constant quartile mismatch indicator of changing rental affordability in US Metropolitan areas, 2000 to 2016." *Cityscape* 21, no. 1 (2019): 163-200.

metropolitan areas are lower than rents, in other metropolitan areas.<sup>2</sup> But even with these lower nominal rents, the Department of Housing and Urban Development found the incidence of renters defined as worst case needs -very low-income renters with incomes below 50 percent of the area median income who do not receive government housing assistance and who either paid more than one-half of their income for rent or lived in severely inadequate condition- to be most concentrated in southern cities.<sup>5</sup> While these two facts may seem conflicting, they actually demonstrate the unique nature of rental affordability in southern metropolitan areas. Though many southern cities are nominally more affordable than cities in the Northeast or Western United States, residents of these cities face some of the most severe affordability issues in the entire country. Thus, to understand rental affordability in southern metropolitan areas, it is insufficient to examine price trends alone. Because the Constant Quartile Mismatch Indicator is designed to measure the relationship between income and rent price, it is better suited to be a gauge of southern rental affordability than metrics focusing primarily on trends in price. To paint an accurate picture of rental affordability in the American south, it is necessary to give as much attention to income dynamics as you give to changes in rents. Further evidence for the need to focus the Constant Quartile Mismatch Indicator specifically on the southern United States can be found within the work of Myers, Dowell and Park.<sup>6</sup> Though their study made no distinction between regional differences of the United States, when closely examining their findings, seven of the ten metropolitan areas experiencing the most severe decreases in affordability were in the southern United States.

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<sup>5</sup> Steffen, Barry L. *Worst case housing needs 2009: Report to Congress*. DIANE Publishing, (2011).

<sup>6</sup> Myers, Dowell, and Park. "A constant quartile mismatch indicator of changing rental affordability in US Metropolitan areas, 2000 to 2016.", (2019).



In the following sections, the differences between traditional indicators of rental affordability and the Constant Quartile Mismatch Indicator will be fully explored. After an examination of the method used to construct this indicator, the study will report and discuss the findings for the chosen geographies.

## **Literature Review**

Housing research in the United States has evolved greatly since it came to prominence in the 1930's. At that time, researchers focused primarily on the inadequate supply of middle-class housing. In an effort to expand the national housing supply, congress established the Federal Housing Authority in 1934. To subsidize the cost of home ownership, the Federal Housing Authority reduced the required down payment for new homeowners, while also allowing them to deduct their mortgage payments from their federal tax bill. As barriers to homeownership fell, the federal government was simultaneously subsidizing the construction of large suburban housing developments. This led to a marked increase in homeownership rates among the American middle class.<sup>7</sup> As these government financed programs increased the nation's housing supply, researchers turned their efforts to chronicling the dilapidated state of America's low-income housing stock. As the civil rights movement took hold in the 60's and 70's, researchers again shifted their focus to exploring how racial segregation was manifested in America's housing.<sup>8</sup> One of the first projects to consider racial segregation's impact on housing was the Kerner report. Commissioned in 1967 by President Johnson, this seminal work concluded that discriminatory barriers in housing led to the concentration of African Americans

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<sup>7</sup>Carliner, Michael S. "Development of federal homeownership "policy"." Housing Policy Debate 9, no. 2 (1998): 299-321.

<sup>8</sup> Linneman, Peter D. and Isaac F. Megbolugbe. "Housing Affordability: Myth or Reality?" Urban Studies (Edinburgh, Scotland) 29, no. 3/4 (1992): 369-392.

in overcrowded ghettos with substandard living conditions and inadequate economic opportunities. These initial findings of disparity were later formalized in works like *Housing Markets and Racial Discrimination: A Microeconomic Analysis*. In this project, researchers used the theory of inefficient markets to illustrate how housing discrimination was able to persist in a market with rational actors.

It wasn't until the late 80's and early 90's that affordability issues took center stage in housing research. Before this period, housing affordability was thought to only impact lower income Americans, but by the end of this era, housing affordability was clearly a middle-class issue as well. As the American economy increasingly outsourced high paying manufacturing jobs, real income growth for the American middle class became stagnant. In contrast to incomes, housing costs continued to rise throughout the 80's and early 90's.<sup>9</sup> The decrease in housing affordability in this era was exacerbated by broad restructuring in the American economy. Sluggish economic growth paired with a decreased the size of the social safety net created a precarious economic environment for lower- and middle-class Americans.<sup>10</sup> Amongst this dynamic, the housing buying power of the American middle class sharply decreased, and as America entered the 90's and early 2000's, these affordability trends persisted. Despite overall economic growth in this era, the median rent to income ratio climbed from 26.9% in 2001 to

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<sup>9</sup> Linneman, Peter D. and Isaac F. Megbolugbe. "Housing Affordability: Myth or Reality?" (1992)

<sup>10</sup> Dwyer, Rachel E. and Lora A. Phillips Lassus. "The Great Risk Shift and Precarity in the U.S. Housing Market." *The Annals of the American Academy of Political and Social Science* 660, no. 1 (2015): 199-216

29.3% in 2007.<sup>11</sup> Unfortunately, the affordability decreases seen in this era would only be worsened by the economic strains of the Great Recession.

Though the Recession impacted all Americans, its impact on housing affordability was most severe for low-income renters who saw marked decreases in the availability of affordable housing and an increasingly precarious job market. In the years preceding the Great Recession, governments at the national, state, and local level made efforts to “streamline” the apparatus of government by privatizing aspects of the social safety net.<sup>12</sup> In housing, this privatization took the form of housing vouchers that could be redeemed in the open market. In providing these vouchers, government shifted resources from the provision of low-cost housing to the subsidization of private housing. Unlike other government assistance programs, federal rental assistance does not function as a safety net, meaning that coverage does not necessarily increase in times of need. Though the number of renters eligible for federal assistance rose by 3.3 million from 2007 to 2011, the number of households receiving aid during this period was nearly constant.<sup>13</sup> These changes to the federal housing assistance program left low-income renters ill equipped to weather the coming economic downturn. As recession level incomes fell, the number of renters classified as very low income increased by 1.8 million, or 7% from 2007 to 2009.<sup>14</sup> With such a drastic drop in the incomes of rental households, competition for units

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<sup>11</sup> Steffen, Barry L. *Worst case housing needs 2009: Report to Congress*. DIANE Publishing, (2011).

<sup>12</sup> Lobao, Linda, Lazarus Adua, and Gregory Hooks. "Privatization, Business Attraction, and Social Services Across the United States: Local Governments' use of Market-Oriented, Neoliberal Policies in the Post-2000 Period." *Social Problems* (Berkeley, Calif.) 61, no. 4 (2014): 644-672.

<sup>13</sup> Radu, Peter. “Shock Waves from the Great Recession: Rental Prices and Food Stamp Enrollment in California, 2009-2012.” *Policy Matters*, (2014).

<sup>14</sup> Steffen, Barry L. *Worst case housing needs 2009: Report to Congress*, (2011).

affordable at lower income levels rose. Competition was increased further by higher income households who began entering the market for low-cost housing at alarming rates. By 2009, higher income households occupied 36% of the rental housing affordable, (costing less than 30% of monthly income), to renters who had incomes between 30% to 50% of area median income.<sup>15</sup> It is unclear what caused higher income households, (those with incomes above \$100,000 a year) to shift into the low-cost rental market, but some evidence suggests that tightening credit and increased foreclosures in the homeownership market pushed more homeowners into the rental market. By 2011, the national homeownership rate had fallen to 66%, its lowest point since 1998.<sup>16</sup> As these novel developments put increasing pressure on the supply of low-cost rental housing, responsive rent increases eroded rental affordability even further. From 2007 to 2009, mean gross rent increased by 10% for renters making below 50% of area median incomes.<sup>17</sup> The decrease in affordability that this influx of new renters caused was exacerbated by decades of decay in America's low-cost housing stock.<sup>18</sup> In the decades leading up to the Great Recession, low-income housing support programs began to shift away from providing physical dwellings and toward providing subsidized vouchers that could be used in the open market.<sup>19</sup> As priorities

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<sup>15</sup> Lens, Michael C. "Extremely low-income households, housing affordability and the Great Recession." *Urban Studies* 55, no. 8 (2018): 1615-1635.

<sup>16</sup> Radu, "Shock Waves from the Great Recession: Rental Prices and Food Stamp Enrollment in California, 2009-2012.", (2014).

<sup>17</sup> JCHS, "The State of the Nation's Housing.", (2018).

<sup>18</sup> Ranghelli, "The immediate crisis in public and assisted housing: More than a million affordable homes are at risk. Washington, DC: Center for Community Change", DC Center for Community Change, (1999).

<sup>19</sup> Orlebeke, Charles J. "The evolution of Low-Income housing policy, 1949 to 1999." *Housing policy debate* 11, no. 2 (2000): 489-520.

shifted, the department of Housing and Urban Development sought to reduce its stock of public housing units. This led to creation of HOPE VI, a \$5 billion federal program tasked with the renovation of the nation's public housing stock. From 1992 to 2010, grants from the HOPE IV program funded the demolition of 96,200 public housing units. To counteract this reduction in the low-income housing stock, HOPE VI demolitions were required to provide comparable housing options to the residents of demolished buildings either through the construction of new housing or the provision of housing vouchers. Under HOPE VI, 56,800 affordable units were constructed to replace the demolished public housing units, the rest of the displaced residents were issued vouchers.<sup>20</sup> Advocates for the HOPE VI program believed that providing vouchers to low-income residents would help to break the concentration of poverty in urban neighborhoods by allowing residents to move into higher income communities.<sup>21</sup> Unfortunately, independent studies have concluded that housing vouchers are not a cure all for displaced residents. Because many landlords are hesitant to take on renters with public vouchers, many displaced residents had difficulty finding an adequate unit which would redeem their vouchers. In the case of HOPE VI, 40% of displaced renters reported being forced to housing unit of lower quality than their former public housing unit.<sup>22</sup> Over its 18-year run, HOPE VI decreased the affordable housing stock by 39,400 units while simultaneously pushing hundreds of thousands of low-income renters across the nation into the private rental market. In the decades preceding one

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<sup>20</sup> Gress, Taryn, Seungjong Cho, and Mark Joseph. "HOPE VI data compilation and analysis." National Initiative on Mixed-Income Communities, Case Western Reserve University (2016).

<sup>21</sup>Curley, Alexandra M. "Relocating the Poor: Social Capital and Neighborhood Resources." *Journal of Urban Affairs* 32 (2018): 79–103.

<sup>22</sup> Popkin, Susan J., Bruce Katz, Mary K. Cunningham, Karen D. Brown, Jeremy Gustafson, and Margery Austin Turner. "A Decade of HOPE VI." Urban Institute, May 4, 2020. <https://www.urban.org/research/publication/decade-hope-vi>.

of the worst economic crises in American History, a \$5 billion of federal funding went towards a program that significantly reduced the stock of low-income housing. Thus, the low-income rental market was ill equipped to handle additional pressure caused by the entry of high-income renters. Amongst these market forces, the prospect of finding affordable housing became increasingly dubious for low-income Americans.

Coming out of the Recession Era, one might assume that the United State's Affordability Issues would have subsided, but despite improvements in national economic health, the housing affordability picture remains bleak. In 2016, the Joint Center for Housing Studies reported that more than half of all rental households in the United States were paying 30% or more of their income towards housing.<sup>23</sup> These persistent affordability issues may be worse in southern metropolitan areas where the Recession's impact was the most pronounced. A study by the National Institute of Health and Human services shows that unemployment increases were the most severe and persistent in the southern region of the United States.<sup>24</sup> This study also found that the recession's greatest impact was on geographies with high minority populations and low levels of education. Because of a historical pattern of racial discrimination, minority populations in the southern United States tend to have lower levels of education. Given the large minority populations present in many southern cities, there is reason to believe that these cities may have been more vulnerable to the Recession's impact than cities in other regions of the United States.<sup>25</sup> Given the substantial spatial variation in the Great Recession's economic impact, it is

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<sup>23</sup> JHCS "The State of the Nation's Housing", (2018).

<sup>24</sup> Thiede, Brian C., and Shannon M. Monnat. "The Great Recession and America's geography of unemployment." *Demographic Research* 35 (2016): 891.

<sup>25</sup> Lee, Sung-jin, Kathleen R. Parrott, and Mira Ahn. "Exploring housing challenges of low-income minority populations in the Southern United States." *Cityscape* (2012): 73-98.

likely that its impact on housing affordability is not nationally uniform. By examining distributional changes between rents and incomes for southern metropolitan areas from 2000 to 2018, this study hopes to add to our understanding of how rental affordability has fared in the post-recession era.

### **The 30 Percent of Income Standard**

This widely used indicator of housing affordability can be seen in almost all studies of housing affordability. According to this metric, housing affordability is defined as paying less than 30 percent of household income towards gross housing expenses. This indicator is a longstanding measure of housing affordability. The percentage of income affordability standard was first used in the 1940's when it was decided that rent for federally subsidized housing should not exceed 20 percent of household income. The ratio was increased to 25 percent in 1969 and then to its current level of 30% in 1981.<sup>26</sup> The price to income ratio used in this indicator is similar to the one used to establish the poverty line. Both approaches are based on the idea that if a something accounts for too much of a family's income, there will be an insufficient amount left over for other necessities.

Because of its wide use, the 30 Percent of Income Standard is often thought of as the premier measure of affordability. However, this metric is not without shortcomings. The first flaw seen in this measure is that it may overestimate affordability issues in higher income renters. Because the cost of non-housing related essential goods is likely to be the similar for high and low-income renters. It may be possible for higher income households to spend more than 30 percent of their income on rent without being financially distressed by their housing cost.

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<sup>26</sup> "Defining Housing Affordability: HUD USER." Defining Housing Affordability | HUD USER. Accessed March 21, 2021. <https://www.huduser.gov/portal/pdredge/pdr-edge-featd-article-081417.html>.

For example, a cost burden rental household making \$30,000 would have \$21,000 left over after paying rent while one making \$100,000 would have \$70,000 left over. According to the income to rental cost ratio, these houses face the same burden, but the lower income household is likely to have a harder time getting by than the higher income household. This shortcoming may have become more prescient in recent years. Since 2015, the growth in cost burden renters in high- or middle-income groups has outpaced the growth in lower income groups.<sup>27</sup> The second issue with the 30 Percent of Income Standard is that it does not account for how expenses would vary with family size. For example, if two households have the same income and pay the same 35 percent for rent, but one has no children while the other has five, the first house might have adequate income after rent to cover expenses while the second house's income may be inadequate. The Final Issue with the 30 Percent of Income Standard is that it understates affordability issues for the lowest income Americans. For example, if a household makes \$7,500 a year, and paid 29 percent for housing it would only have \$444 a month to spend on all other needs. This is clearly unsustainable, but by this measure this household would not be classified as cost burdened.<sup>28</sup>

Outside of these structural deficiencies, additional issues become apparent when using the 30 Percent of Income Standard to compare affordability across metro areas. Despite having some of the highest cost housing, San Francisco and Seattle have lower incidence of rental cost

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<sup>27</sup> Herbert, Christopher, Alexander Hermann, and Daniel McCue. "Measuring Housing Affordability: Assessing the 30-Percent of Income Standard." *Joint Center for Housing Studies of Harvard University: Cambridge, MA, USA* (2018).

<sup>28</sup> Pelletiere, Danilo. "Getting to the heart of housing's fundamental question: How much can a family afford? A primer on housing affordability standards in US housing policy." A primer on housing affordability standards in US housing policy (2008).



burden than several cities in the southern and Mid-Western United States.<sup>29</sup> This anomalous finding is likely explained by the wage growth both of those cities have seen during their respective tech booms.<sup>30</sup> This illustrates the fact that when using the 30 Percent of Income Standard, we are unable to isolate whether changes in affordability are the results of shifts in rents or shifts in incomes. Overall, the 30 Percent of Income Standard provides a useful summary of housing affordability in an area. However, because it seeks to aggregate the experience of all renters into one metric, the 30 percent of Income Standard is unable to provide a nuanced depiction of rental affordability in an area.

### **The Residual Income Approach**

This affordability metric estimates the cost of a household's non housing related expenses and then subtracts that estimate from total household income. If the remaining income, (residual income), is insufficient to cover the household's gross housing expenses, it is defined as shelter poor. The logic underlying this approach is that if a household's residual income is exceeded by its housing cost, then the household will have to forgo non housing related essential to cover its housing costs.

One benefit of this approach is that since its estimate of the cost of essential goods increases with additional household members, it is sensitive to family size. As a result of this sensitivity, this metric yield substantially different results than the 30 percent of Income Standard. In general, the residual income approach produces higher cost burden rates for larger

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<sup>29</sup> Herbert, Christopher, Alexander Hermann, and Daniel McCue. "Measuring Housing Affordability: Assessing the 30-Percent of Income Standard.", (2018).

<sup>30</sup> Center, N. F. Renting in America's Largest Metropolitan Areas. "*National Affordable Rental Housing Landscape, Report*." (2016).

families and lower rates for smaller families and single-person households.<sup>31</sup> An additional benefit of this approach is that its estimates account for cost-of-living differences across regions. This can be a critical distinction to make. Consider two identical households both making \$30,000 a year with identical housing cost but one lives in downtown Los Angeles where living expenses are extremely high while the other lives in rural Ohio where living expenses are relatively low. If both are left with \$21,000 after they pay gross housing expenses, the Ohio household will have a much easier time making ends meet than the Los Angeles household. In accounting for this difference, the Residual Income Approach paints a more accurate depiction of the cost burden households face.

The difficulty with using this metric is that calculating cost of living can be a difficult task. Finding the data necessary to make cost of living estimations is laborious, and in more rural areas, the data available may be of questionable quality or even nonexistent.

### **The Affordable Supply Gap**

This measure is focused on the supply of low-cost rental housing. To compute this measure, the number of extremely low-income renters, (those making less than 50 percent of the median area income), is compared to the number of rental units in an area that would be affordable for extremely low-income renters. At the national level, it is estimated that for every 100 extremely low-income renters, there are 67 affordable housing units.<sup>32</sup> The benefit of this measure is that it gauges rental availability. Such a gauge is increasingly necessary. In the years following the Great Recession, there has been a nationwide decrease in the supply of rental

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<sup>31</sup> Herbert, Christopher, Alexander Hermann, and Daniel McCue. "Measuring Housing Affordability: Assessing the 30-Percent of Income Standard.", (2018).

<sup>32</sup> National Low Income Housing Coalition. "The gap: A shortage of affordable rental homes." (2016).

housing alongside an increase in the number of rental households. This dynamic has put newfound pressure on the affordable housing market. An additional benefit of this approach is that it can provide insight into the success of government efforts to increase the affordable housing stock. Because it reports a ratio of low-income renters to affordable units, this metric can help policy makers to determine if efforts to increase affordable housing stock are keeping pace with the growing number of low-income renters.

One issue with this metric is that it assumes that low-cost units will be occupied by low-income renters, but this assumption may not always be warranted. In recent years, studies have found that low-income units are increasingly occupied by middle to high income renters.<sup>33</sup> Thus, the Affordable Supply Gap may overstate the supply of low-income rental housing. To account for this inconsistency, more recent studies have calculated the supply gap by comparing the number of low-income renters to the number of rental units that are affordable and available, where available is defined as a unit that is vacant or occupied by a low-income renter. Adding this caveat significantly bleakness the outlook for low-income renters. According to the NILHC, for every 100 extremely low-income renter in the United States there are 35 rental units meeting the criteria of affordable and available.<sup>34</sup>

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<sup>33</sup> Lens, "Extremely low-income households, housing affordability and the Great Recession.", (2018).

<sup>34</sup> "The gap: A shortage of affordable rental homes.", (2016).

## **Constant Quartile Mismatch**

To track changes in rental affordability, the Constant Quartile Mismatch indicator picks a base year to establish quartile boundaries for the rents paid and incomes earned by the renters in a metropolitan area. It then applies an inflation adjusted version of those boundaries to the distribution of the same city's renters in a future year. The change in the distribution between the base year and the later year is defined as the constant quartile mismatch. Because it is calculated as the difference between a base year and a comparison year, this indicator is designed to measure affordability changes over time. This makes the Constant Quartile Mismatch an especially effective tool for portraying how affordability has developed in an area over a given period. Because this indicator defines separate distributions for rents and incomes, it is able track changes in rents and incomes separately. By comparing these changes independently, this indicator is able to note when shifts in the income and rent distribution do not match. The unique advantage that this approach has over other affordability measures is that it disentangles rent and income effects. As a result, this measure makes it easy to determine if changes in rental affordability are caused by increases in rents or inadequate increases in incomes. Understanding the interplay between these two dynamics paints a more wholistic picture of rental housing affordability. One benefit of the Constant Quartile Mismatch indicator is that it distinguishes between affordability changes at the high and low ends of the income spectrum. In a metropolitan area, affordability can decrease when there is a surplus of high-cost units compared to the number of high-income renters or when there is a dearth of low-cost units compared to the number of low-income renters. The Constant Quartile Mismatch Indicator distinguishes between these two phenomena by calculating "high end mismatch" and "low end mismatch" separately. By distinguishing between these two forms of mismatch, this indicator is sensitive to what end of

the income spectrum is experiencing affordability changes. This sensitivity provides researchers with a more nuanced understanding of affordability dynamics in a metropolitan area.

## **Methods**

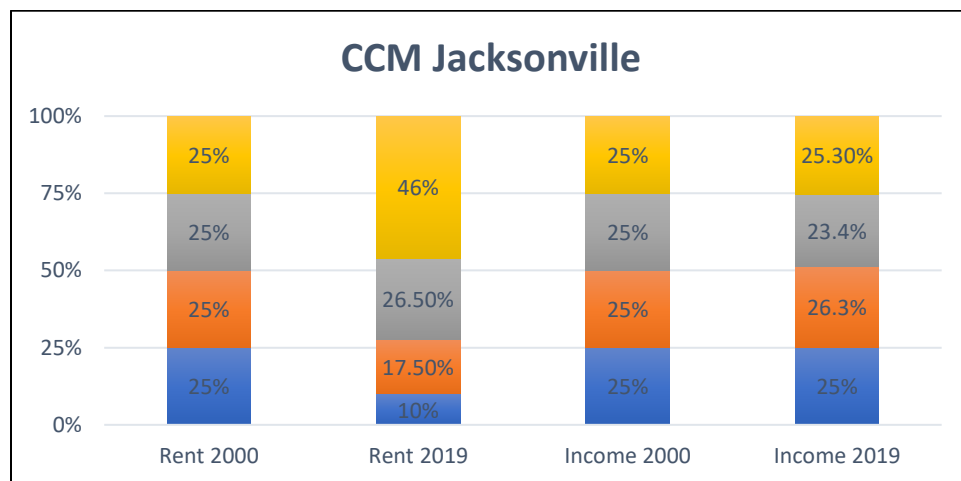
To answer the question of how changes in rents compare to changes in incomes for renters in the southern United States this study analyzes the 15 most populated southern cities from 2000 to 2019. To measure changing affordability dynamics within the chose cities, this study calculates their Constant Quartile Mismatch. The Constant Quartile Mismatch method examines changes the rent and income distributions of a given population to see how rental prices in an area have changed in relation to incomes. To calculate the constant quartile mismatch for the metropolitan areas in question, I compiled data from the Decennial Census 5 percent Public Use Microdata Sample. IPUMS houses the world's largest publicly accessible database of census microdata. The microdata contained in this database is structured in a way that allows for accurate comparisons across locations and time periods. This makes the IPUS data base a useful resource for researchers examining social and economic change. Because the IPUMS database provides responses to Census inquiries at the individual or household level, it lends itself to research projects with interest in a specific subset of a population. As to protect individual privacy, some of these individual responses are unavailable for public analysis, but the sample size available is generally considered large enough to be representative of larger trends. This sample is useful for our study because its responses contain information about a household's yearly income and their gross rent, the two pieces of information needed to calculate constant quartile mismatch. Additionally, because of the structure of the Constant Quartile Mismatch metric, it is necessary to analyze a microdata sample so that the quartile breaks from the base year can be applied to the distribution of renters in the chosen year of analysis. From this IPUMS sample, I compiled information on Income and Gross Rents Paid for the years 2000

and 2018. At this point, my data set contained the rents paid and incomes earned for every IPUMS respondent in the United States. To organize these respondents by metropolitan area, I used the geographic identifier Met 2013. This variable connects each respondent with a geographic code corresponding to their area of residence so that it is possible to construct a respondent base for every metropolitan statistical area as defined by the US office of Budget and Management. Using this identifier variable, I was able to isolate any given metropolitan area for individual analysis.

To understand the Constant Quartile Mismatch Analysis more concretely, let us consider how it can be generated for the metropolitan area of Jacksonville, Florida. I began by isolating residents of the Jacksonville metro area. To do this, I filtered the respondents with the Met 2013 code corresponding to Jacksonville into a separate data set. I then further filtered my new data set to isolate residents from the year 2000. With this new data set containing the rents paid and incomes earned for renters in the Jacksonville metro area in 2000, I am able to generate the baseline quartiles for my analysis. I begin by generating the quartile breaks for Monthly Gross Rents Paid. These dollar denominated quartile breaks are easily generated by statistical software. In the case of Jacksonville, my quartile breaks were, [Q1: \$470, Q2: \$663, Q3: \$801]. Using the CPI to adjust these breaks for inflation from 2000 to 2018, I found [Q1: \$685.37, Q2: \$923.06, Q3: \$1168.04]. I then refiltered my data set to include only Jacksonville renters in the year 2018. After generating a percentile distribution from this data set, I was ready to apply my inflation adjusted quartile breaks. Using these breaks, I concluded that in 2018, 10 percent of renters paid \$685.37 or less for rent, 17.5% paid between \$685.38-\$923.06, and 26.5 percent paid between \$923.07- \$1168.04. I then repeated this entire process for the variable of yearly income. The results of these two Constant Quartile Distributions are reported graphically in Figure 1. In this

instance, the growth in the percentage of renters paying what were once considered fourth quartile level rents far outpaces the growth in the percentage of renters earning what were once considered fourth quartile level incomes, (25% to 46% versus 25% to 25.3%). Conversely, the percentage of renters paying what were once first quartile rents decreased to 10 percent while the percentage earning what were once considered first quartile incomes remained constant.

**Figure 1**



Source: IPUMS Microdata Files

To calculate the Constant Quartile Mismatch from these distributions, we would sum the difference between the growth in rents and incomes at the high and low end of the distributions so for Jacksonville total mismatch could be calculated as

$$(46 - 25.5) + (25 - 10) = 35.5$$

$$(\text{high end}) + (\text{low end}) = \text{Total}$$

It should be noted that the total mismatch is always calculated as the sum of the high- and low-end mismatches. This exact method can be repeated to find the Constant Quartile Mismatch for any metropolitan area in the data set.

## **Results**

**Table 1: Mismatch Rankings for 15 Largest Southern Cities**

<b>City</b>	<b>High End Mismatch</b>	<b>Low End Mismatch</b>	<b>Total Mismatch</b>	<b>Case Type</b>
Baltimore, Maryland	28.9	11.3	40.2	2
Washington, District of Columbia	27.5	12	39.5	2
Dallas, Texas	23.4	14.8	38.2	2
Jacksonville, Florida	20.7	15	35.7	1
San Antonio, Texas	21.9	13	34.9	2
Memphis, Tennessee	20.2	12.3	32.5	3
Austin, Texas	19.8	11.5	31.3	2
Nashville, Tennessee	22.6	8.1	30.7	2
Houston, Texas	11.5	16.5	28	2
Atlanta, Georgia	17.4	9.2	26.6	1
Oklahoma City, Oklahoma	16.1	9.8	25.9	2
Charlotte, North Carolina	15.7	9.7	25.4	1
Louisville, Kentucky	13.6	8.6	22.2	1
Raleigh, North Carolina	11.3	6.9	18.2	2
El Paso, Texas	10.2	7.8	18	2

Source: IPUMS Microdata Files

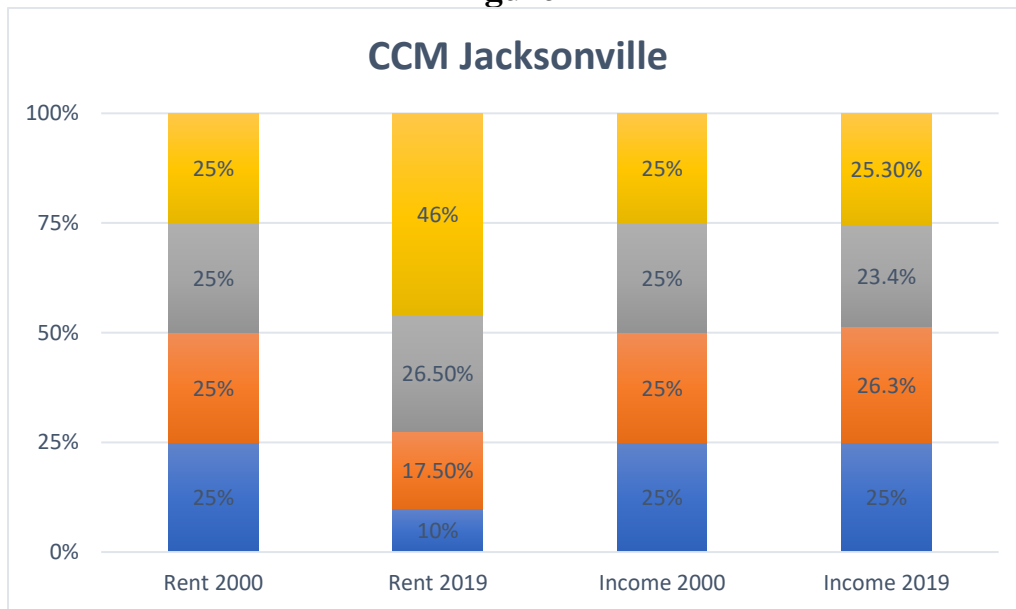
Table 1 ranks the 15 most populated southern metropolitan areas by their total constant quartile mismatch. Broadly, this ranking reveals the cities that saw the greatest decreases in rental affordability from 2000 to 2019. Though they vary in magnitude, each city in question has a positive value for total mismatch, indicating that from 2000 to 2019 rental affordability decreased in each of the 15 most populated southern cities. While these total mismatch rankings are instructive, the unique benefit of the Constant Quartile Mismatch Indicator is that it allows us to dissect the causes of changing affordability. When examining the Quartile Mismatch data for each of these cities, the causes of deteriorating affordability can be generalized into three representative cases.



## **Case 1: Stagnant Incomes and Rising Rents**

In metropolitan areas described by case 1, the distribution of renter incomes closely reflects the inflation adjusted quartile breaks from the base year. An example of case 1 can be seen in Figure 2, which portrays the changes in rent and income distributions for the city of Jacksonville. In Jacksonville, the top income quartile has held almost constant, rising only .3 percent from 2000 to 2019. Similarly, the bottom quartile distribution remained constant at 25 percent of renters. In contrast to the stability of the income distribution, the rent distribution saw significant changes over the period. At the top of the distribution, 46 percent of renters were paying what were once fourth quartile rents. While at the bottom of the distribution, only 10 percent of renters are paying rents at the former first quartile level. When comparing the constant quartile distributions for rent and income, the causes of deteriorating affordability are readily apparent. With 46 percent of renters paying inflation adjusted fourth quartile rents, and miniscule growth in the percentage of renters receiving inflation adjusted fourth quartile incomes, it must be the case that renters from lower income groups are being charged rents at a level once reserved for renters in the top income quartile. On the bottom end the income distribution, the disparity between the 2019 rent and income distributions means that 15 percent of renters who once paid first quartile rents now pay rents above that level while still receiving first quartile incomes. By examining the constant quartile distribution for Jacksonville, it is clear that in cities defined by case 1, decreasing affordability from stems increases in real rents without similar increases in real incomes.

**Figure 2**

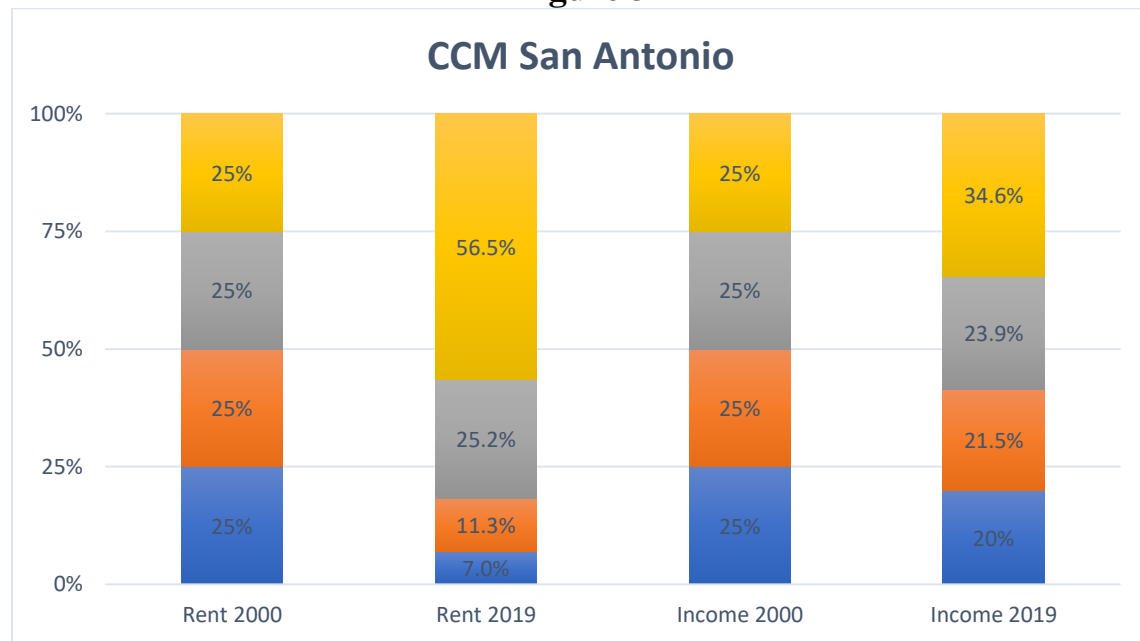


## **Case 2: Rising Incomes and Rising Rents**

In cities defined by case 2, there is an upward shift in both the rent and income distributions. An example of this can be seen in Figure 3, which displays the constant quartile mismatch distributions for the city of San Antonio. From 2000 to 2019, San Antonio saw significant increases in the top of the income distribution with 34.6 percent of renters earning former fourth quartile incomes. On the bottom end of the distribution, income gains were present but less drastic with 20 percent of renters earning former first quartile incomes. Like the income distribution, the rent distribution also saw an upward shift over this period. By 2019, 56.5 percent of San Antonio renters paid what were once fourth quartile rents. While only 7 percent of renters paid former first quartile rents. Though real incomes for San Antonio renters increased over this period, they did not keep pace with increases in real rents paid giving San Antonio a high-end mismatch of  $(56.5)-(34.6) = 21.9$  and a low-end mismatch of  $(20)-(7)=13$ . Rental affordability is defined by incomes earned and prices paid, and in the case of San Antonio

increases in incomes earned were not significant enough to offset the increase in rental prices paid.

**Figure 3**

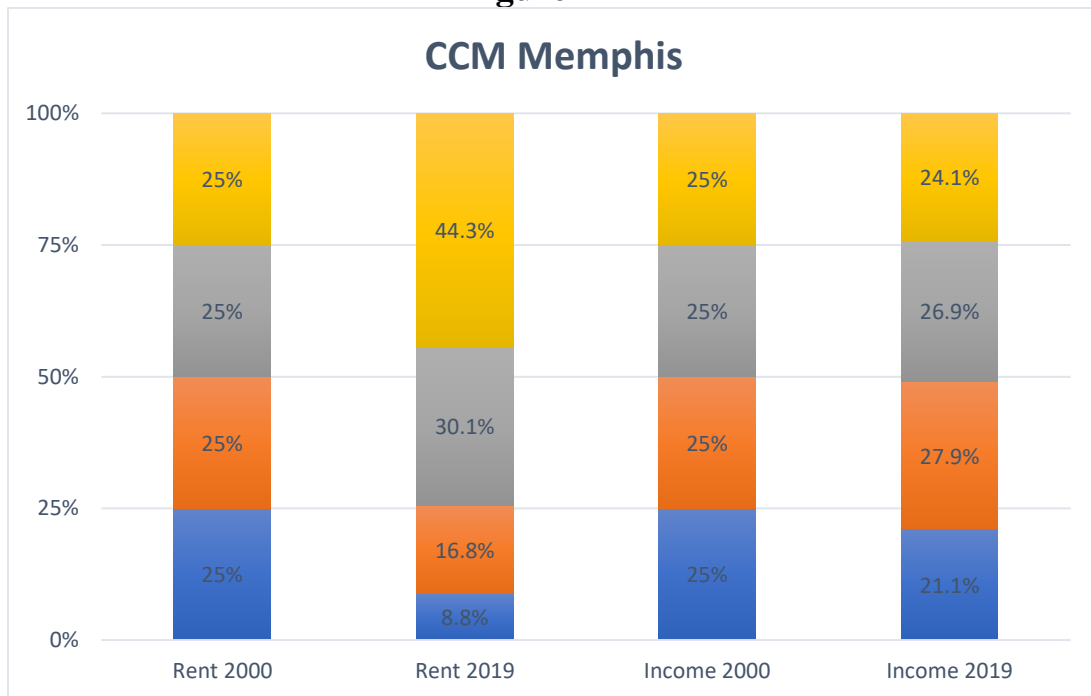


Source: IPUMS Microdata Files

### **Case 3: Falling Incomes and Rising Rents**

In cities defined by case 3, there is a downward shift in the distribution of incomes and an upward shift in the distribution of real rents. An example of case 3 can be seen in Figure 4 which displays the constant quartile mismatch distributions for the city of Memphis, Tennessee. From 2000 to 2019, Memphis saw a slight decrease in the percentage of renters who once earned fourth quartile incomes. At the same time, Memphis saw affordability decreases on the high and low ends of the rental distribution, with 44.3 percent of renters paying former fourth quartile rents and 8.8 percent of renters paying former first quartile rents. In case 3 cities like Memphis, rent and income effects work in the same direction to reduce affordability.

**Figure 4**



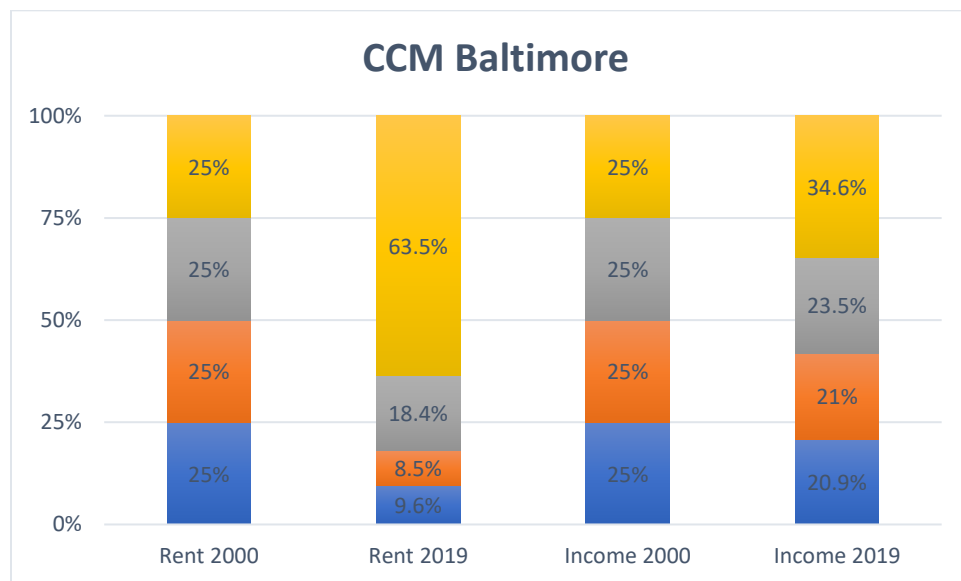
Source: IPUMS Microdata Files

### **Most Sever and Mild Cases**

The city that saw the most severe decrease in Affordability was Baltimore, with a total mismatch of 40. As seen in Figure 5, Baltimore saw upward shifts in both rent and income distributions from 2000 to 2019. In 2019, 34.6 percent of Baltimore renters were earning incomes at a level that would have put them in the top income quartile in 2000. However, the drastic increase in size of the top rent quartile was significant enough to offset any affordability gains associated with income. With 63.5 percent of renters paying what were once first quartile rents, Baltimore had a high-end mismatch of  $(63.5)-(34.6) = 28.9$  largest of any of the cities analyzed in this study.

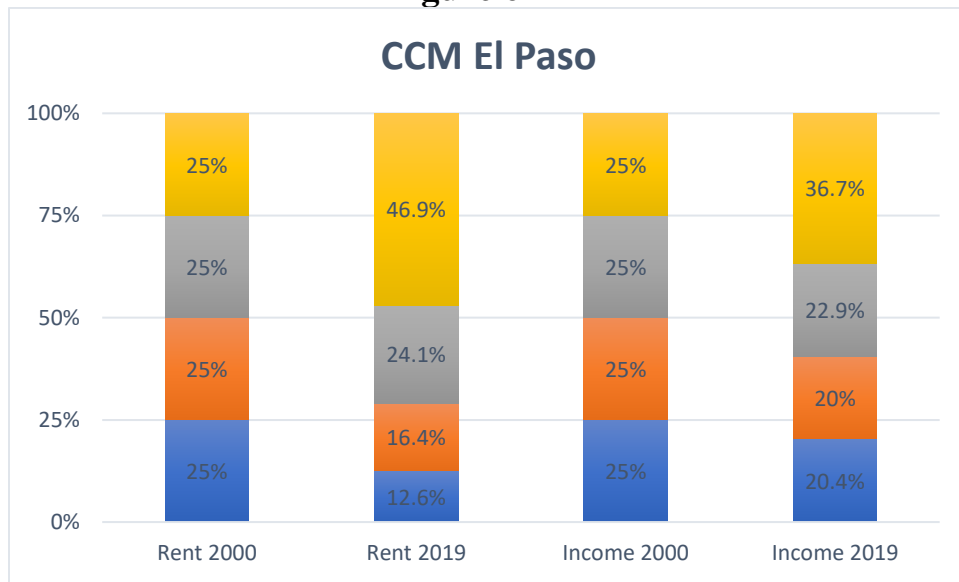
The city that saw the least severe decreases in affordability was El Paso Texas. From 2000 to 2019, El Paso saw a total constant quartile mismatch of 18. As seen in figure 6, El Paso saw an upward shift in both rent and income distributions. With 36.7 percent of renters earning former fourth quartile incomes, and 20.4 percent of renters earning former first quartile incomes real wages increased for those at the top and bottom end of the income distributions. Conversely, by 2019, 46.9 percent of renters in El Paso were paying what were once fourth quartile rents. While the increases in real income were not large enough to offset the increases in real rents, the disparity for the high end of the rent and income distributions was the smallest of any of the 15 cities, giving El Paso the smallest high-end mismatch.

**Figure 5**



Source: IPUMS Microdata Files

**Figure 6**



Source: IPUMS Microdata Files

### **Incidence of Cases**

The distribution of cases is defined as follows. Of the 15 cities analyzed, 10 are defined by Case 2 (rising incomes rising rents). 3 are defined by Case 1 (stagnant incomes rising rents). 2 are defined by Case 3 (falling incomes rising rents).

**Table 2: Distribution of Cases Across Cities**

Case Type	Case 1 (Stagnant Incomes Rising Rents)	Case 2 (Rising Incomes Rising Rents)	Case 3 (Falling Incomes Rising Rents)
Incidence	3	10	2

Source: IPUMS Microdata Files

These three categories organize cities by the underlying cause of their changing affordability. Such organization is useful in that it allows us to draw parallels between cities experiencing the same affordability dynamics. However, these categories do not give much insight into the level of affordability decrease. It is worth noting that the cities with the highest and lowest total mismatch both fit the definition of Case 3. This indicates that the source of a city's declining affordability does not necessarily reflect its severity.

## **Discussion**

Through calculating Constant Quartile Mismatch Indicators, we have been able to determine the total change in rental affordability from 2000 to 2019 for the 15 largest metropolitan areas in the southern United States. By closely examining the constant quartile distributions calculated in this study, we have also been able to illicit the cause of changing affordability. These causes can effectively be separated into income and rent effects. From the analysis above, we see that each of the cities in question had increases in real rents that decreased affordability at the high and low ends of the distributions. Where these cities differ is in their income effects. The two cities defined by case 3 saw decreases in real incomes that worked to decrease rental affordability. The three cities defined by case 1 saw stagnant incomes that had no impact on affordability. The ten cities defined by case 2 saw increases in real incomes. The income effects in these cities worked to improve affordability, but none of the cities in this analysis had income effects strong enough to outweigh rent effects.

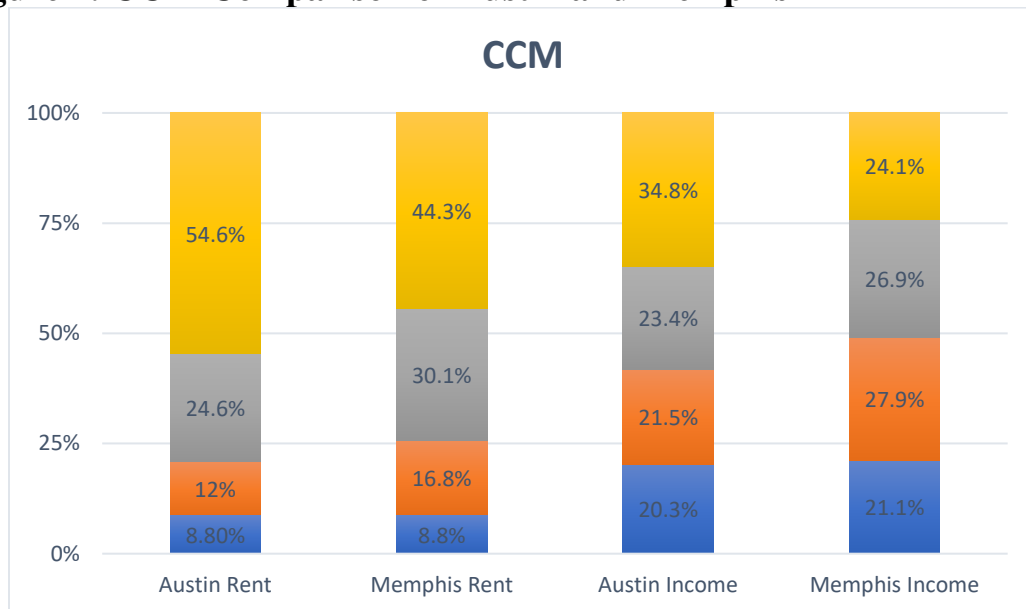
By separating these rent and income effects, we can paint a more nuanced picture of affordability than can be seen from changes in nominal prices. For example, consider rental affordability in the cities of Austin and Memphis. If we compared rental affordability from 2000 to 2019 between these two cities using nominal prices changes alone, Austin would appear to have more drastic deterioration in affordability as their nominal rents have seen a 77 percent increase over the period compared to a 65 percent increase in Memphis.<sup>35</sup> But after separating rent and income effects with the Constant Quartile Mismatch Indicator, we see Memphis's decrease in affordability is actually more significant than Austin's. Despite the higher price

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<sup>35</sup> US Census Bureau. Median Gross Rent, 2000. Prepared by Social Explorer. (accessed March 15 9:00 CST 2021).

levels seen in Austin, its total mismatch, 31.3, is less than Memphis's, 32.5. Though these results may seem counter intuitive, they are actually supported by the two city's mismatch data as seen in figure 7. Austin's rent effects outweigh Memphis's with 54.6 percent of Austin renters paying what were once top quartile rents compared to 44.3 percent in Memphis, but in Austin, the income effect works to counteract rent increases while in Memphis, the income effect actually worsens rental affordability. In this case, accurately representing affordability changes for these two cities requires an understanding that affordability is equally impacted by rents and incomes. By separating rent and income effects, the Constant Quartile Mismatch Indicator prevents us from overweighting the impact of nominal price changes on affordability.

**Figure 7: CCM Comparison of Austin and Memphis**



Source: IPUMS Microdata Files

A unique benefit of the Constant Quartile Mismatch Indicator is its ability distinguish between affordability changes on the high and low ends of the income spectrum. To determine how affordability has shifted for low-income renters, the Constant Quartile Method calculates



low end mismatch. Low end mismatch is calculated by subtracting the percentage of renters who are paying what were once first quartile rents from the percentage of renters who are earning what were once first quartile incomes. This low-end mismatch captures the changes in the availability of low-cost units relative to the size of low-income earners in a metropolitan area. Consider the low-end mismatch seen in Baltimore, in 2019, 20.9 percent of renters were earning what were once bottom quartile incomes, but only 9.6 percent of renters were paying what were once bottom quartile rents. Thus, 11.3 percent of low-income Baltimore renters who are still earning bottom quartile rents are now paying rents above the bottom quartile. Based on the positive low end mismatch totals for each city in this analysis, it is clear that rental affordability for the lowest income renters has deteriorated across the board. In table 2, each of the metropolitan areas in this analysis is ranked by their level of low-end mismatch. For cities at the top of this ranking, a large portion of overall affordability decreases come from the low end of the income spectrum. Since low-income households are the income group most severely impacted by affordability decreases, this distinction is not purely academic. While high end mismatch is a significant issue, higher income households affected by this mismatch may be able to weather declining rental affordability through the reduction of other expenditures. For low-income households, declining affordability may present a more serious issue as housing cost typically compose a larger portion of their expenditures. The disproportionate impact of affordability changes on different income groups should be noted when considering overall rental affordability in a metro area. For cities at the top of Table 2, these low-end mismatch figures should be concerning.

**Table 3: 15 Largest Southern Cities Ranked by Low End Mismatch**

City	High End Mismatch	Low End Mismatch	Total Mismatch
Houston, Texas	11.5	16.5	28
Jacksonville, Florida	20.7	15	35.7
Dallas, Texas	23.4	14.8	38.2
San Antonio, Texas	21.9	13	34.9
Memphis, Tennessee	20.2	12.3	32.5
Washington, District of Columbia	27.5	12	39.5
Austin, Texas	19.8	11.5	31.3
Baltimore, Maryland	28.9	11.3	40.2
Oklahoma City, Oklahoma	16.1	9.8	25.9
Charlotte, North Carolina	15.7	9.7	25.4
Atlanta, Georgia	17.4	9.2	26.6
Louisville, Kentucky	13.6	8.6	22.2
Nashville, Tennessee	22.6	8.1	30.7
El Paso, Texas	10.2	7.8	18
Raleigh, North Carolina	11.3	6.9	18.2

Source: IPUMS Microdata Files

By separating income and rent effects and distinguishing between affordability changes at different ends of the income distribution, the Constant Quartile Mismatch Indicator provides a nuanced description of affordability changes within a metropolitan area. Understanding such nuance could have major implications for affordable housing policy. By focusing on the underlying causes of affordability changes, policy makers can tailor affordable housing policy to address the most pressing issues within their city. For example, in a city like Houston where affordability decreases are driven primarily from the low end of the income distribution, with a 16.5 percent low end mismatch compared to an 11.5 percent high end mismatch, housing policy should be focused on improving rental affordability for its lowest income residents. To counteract affordability decreases at this end of the income distribution, it may be beneficial to devote more resources to the provision of public housing. Though affordability housing efforts have shifted away from this strategy in recent decades, it is an effective way to ensure the existence of low-cost units in a metropolitan area. In cities like Houston, where housing

assistance is currently failing to maintain affordability for low-income residents, adding low-cost public rental units into the market could improve affordability for those who need it most. In contrast to Houston, affordability changes in cities like Washington DC have been driven almost entirely by declining affordability at the high end of the income spectrum. In cities facing this issue, it may be best to target affordable housing resources more towards middle income renters. This could be achieved by raising the income eligibility requirements for rental assistance vouchers. By subsidizing the rents of middle-income renters in these cities, housing assistance would increase the housing buying power of renters in this group, helping to offset the disparity between growth in real rents and real incomes in the twenty first century.

While the Constant Quartile Mismatch Indicator offers unique perspective on housing affordability, there are limitations to the indicator that must be considered. Because this indicator is based on changes in population distributions, it is more difficult to interpret than indicators that use a more straight forward approach. It is easier to grasp the percentage of a population paying more than 30% of their income toward housing than it is to understand the significance of Inflation adjusted quartile breaks. Thus, the intricacies of its methodologies may end up hindering the impact that constant quartile mismatch data will have in policy discussions. Another important consideration is that constant quartile mismatch data measures changes in affordability, not the level of affordability. Thus, any well-rounded report of rental housing affordability should supplement constant quartile mismatch findings with a more traditional indicator of total affordability. The final deficiency of the Constant Quartile Mismatch Indicator is its exclusive urban focus. Because IPUMS Microdata is only available for geographies above a certain population threshold, it is not possible to apply Constant Quartile Mismatch Indicator to rural geographies.

## **Conclusion**

Through the application of the Constant Quartile Mismatch Indicator, this study has shown the level of affordability changes for the 15 largest metropolitan areas in the southern United States. Additionally, through close analysis of changing rent and income distributions, this study separated rent and income effects allowing us insight into the underlying causes of affordability changes in each metropolitan area. While other metrics rely on a single rent to income ratio to define affordability in an area. The metric used in this study offers a more wholistic description of rental affordability. Using the Constant Quartile Mismatch Indicator allows us to determine the cause of affordability shifts as well as the income group that has been most impacted by the shift.

This study has illustrated that affordability conditions are not uniform in cities across the south. As such, the housing policies used to improve those affordability conditions should not be either. While this study has proposed a few policy responses, the possible implications of these findings for housing policy are too numerous to fully consider here. Because it addresses the causes and varied impacts of changing housing affordability, the type of analysis performed here, lends itself well to discussions of housing policy. Thus, in their future attempts to address declining rental affordability, policy makers should look beyond measures of overall affordability and toward the type of analysis performed in this study.

While the detailed discussions that the Constant Quartile Mismatch Indicator allows for are insightful, the most significant finding of this study is also its simplest: From 2000 to 2019, housing affordability declined for renters in each of the 15 largest metropolitan areas in the southern United States. The immediate implication of this finding is that as we progressed through the first 19 years of the twenty first century affordability has worsened. The coming

implication may well be that without action rental affordability will worsen as this century progresses.

## Appendix A

City	Q1 Income	Q2 Income	Q3 Income	Q4 Income	Q1 Rent	Q2 Rent	Q3 Rent	Q4 Rent
Baltimore, Maryland	20.9%	21.0%	23.5%	34.6%	9.6%	8.5%	18.4%	63.5%
Washington, District of Columbia	20.3%	19.2%	23.5%	37.0%	8.3%	7.7%	19.5%	64.5%
Dallas, Texas	22.2%	24.8%	22.5%	30.5%	7.4%	14.9%	23.8%	53.9%
Jacksonville, Florida	25.0%	26.3%	23.4%	25.3%	10.0%	17.5%	26.5%	46.0%
San Antonio, Texas	20.0%	21.5%	23.9%	34.6%	7.0%	11.3%	25.2%	56.5%
Memphis, Tennessee	21.1%	27.9%	26.9%	24.1%	8.8%	16.8%	30.1%	44.3%
Austin, Texas	20.3%	21.5%	23.4%	34.8%	8.8%	12.0%	24.6%	54.6%
Nashville, Tennessee	23.1%	22.3%	25.9%	28.7%	15.0%	14.2%	19.5%	51.3%
Houston, Texas	23.5%	21.5%	24.0%	31.0%	7.0%	12.0%	23.5%	57.5%
Atlanta, Georgia	23.9%	26.8%	23.5%	25.8%	14.7%	20.7%	21.4%	43.2%
Oklahoma City, Oklahoma	20.5%	21.9%	25.4%	32.2%	10.7%	17.9%	23.1%	48.3%
Charlotte, North Carolina	24.9%	25.5%	20.7%	28.9%	15.2%	16.9%	23.3%	44.6%
Louisville, Kentucky	24.5%	24.9%	22.1%	28.5%	15.9%	14.1%	27.9%	42.1%
Raleigh, North Carolina	24.0%	25.0%	21.6%	29.4%	17.1%	19.8%	22.4%	40.7%
El Paso, Texas	20.4%	20.0%	22.9%	36.7%	12.6%	16.4%	24.1%	46.9%

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